

NASA TECH BRIEF

Langley Research Center



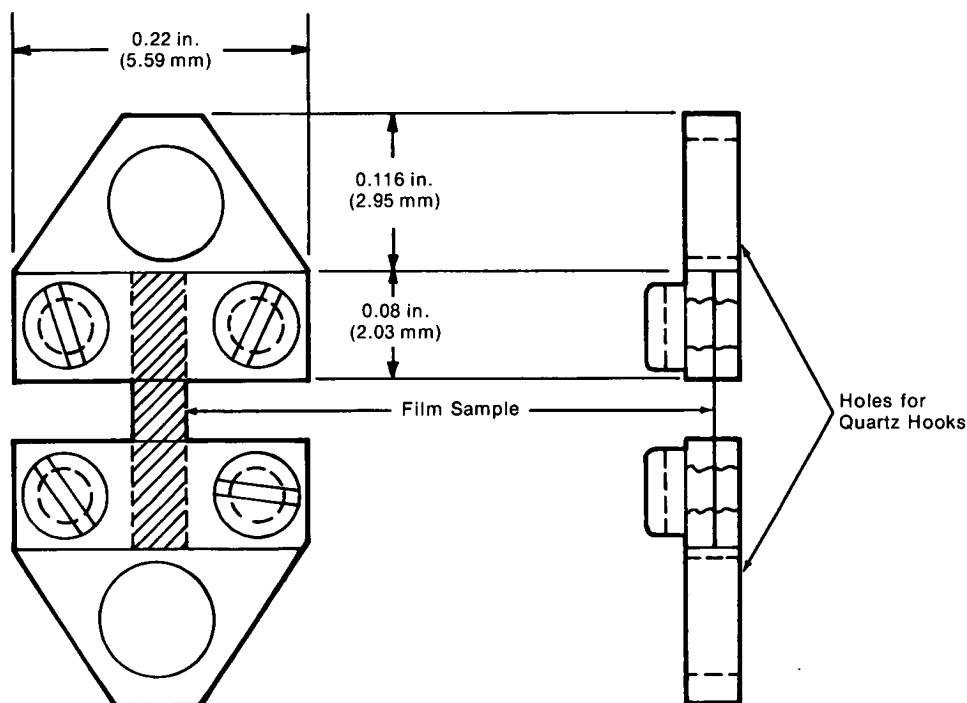
NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Film Mounting Method for Thermomechanical Analysis

A new sample mounting method has been developed at Langley Research Center to aid in the thermomechanical characterization of polymeric materials. The mounting clamps shown in the illustration were devised to attach a polymeric film sample to a thermomechanical analyzer (DuPont 941, or equivalent). Using this technique, the temperature at which the polymer passes from a relatively nonflexible or glasslike state to a rubbery condition where it exhibits a marked increase in flow properties is readily determined. This glass transition temperature (T_G) is one of the most difficult physical properties of polymeric materials to determine with any degree of

precision. Its value is important because it helps to determine the processing capacity of polymers, since generally polymers must be heated to this transition point or higher for proper processing and fabrication.

In using the thermomechanical analyzer (TMA) as recommended, a strip of film is prepared with a hole at each end. The specimen is fastened between two quartz hooks of the TMA. The upper hook is fixed; the lower one is weighted and movable. The latter is connected to the core of a linear variable differential transformer, and its movement indicates the stretching of the film under a predetermined load and heating rate. However, the T_G of polymer film cannot



Stainless-Steel Clamps With Film Sample

(continued overleaf)

be detected using this mounting arrangement because the elongation of the sample holes during the entire heating period is considerably greater than the stretching at T_G .

The pictured device was designed to overcome this problem. It consists of a pair of small 17-4PH stainless-steel clamps which secure the film sample and slip over the quartz hooks. They accommodate film samples with a nominal test area (the sample area between the clamps) of approximately 0.05 by 0.04 in. (1.27 by 1.02 mm) and from 0.0005 to 0.002 in. (0.0127 to 0.05 mm) thick, and they have been used from below room temperature to 485° C with no apparent slippage. The nominal weight of the clamps with a sample mounted is approximately 0.375 gram.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Langley Research Center
Mail Stop 139-A
Hampton, Virginia 23665
Reference: B75-10072

Patent status:

NASA has decided not to apply for a patent.

Source: Harold D. Burks
Langley Research Center
(LAR-11330)